BLM Calibration Summary
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Note added: The C336 integrator has a noise threshold which prevents counting at low currents – this can cause some of the non-linearity discussed in this note (RL 1/15/2004).

This is a brief summary of BLM calibration tests done on April 30, 2002. The purpose was to understand the anomalous readings of some of the downstream BLMs for low to moderate dose rates. Calibration was performed with a Keithley 220 current source. It's calibration was verified with a Keithley 487 picoammeter.

The TeV chassis log amp has a nominal 0.5 V output pedestal. These voltages were found to vary from 0.484 V to 0.518 V. All pedestals were set to 0.52 V after these tests were completed.

Channel	Voltage	Name
0	0.507	UT
1	0.505	UO
2	0.484	UB
3	0.518	UI
4	0.498	DT
5	0.492	DO
6	0.495	DB
7	0.506	DI

Linearity was checked by varying the input current between 0.5 and 100 na (70 na=1 rad/sec). At low currents (<0.5 na) the readings fluctuated and the peak value is plotted. Figures 1 shows the response of the BLMs and figure 2 shows the normalized response as a function of input current. There is clearly substantial nonlinearity of response at the low end.

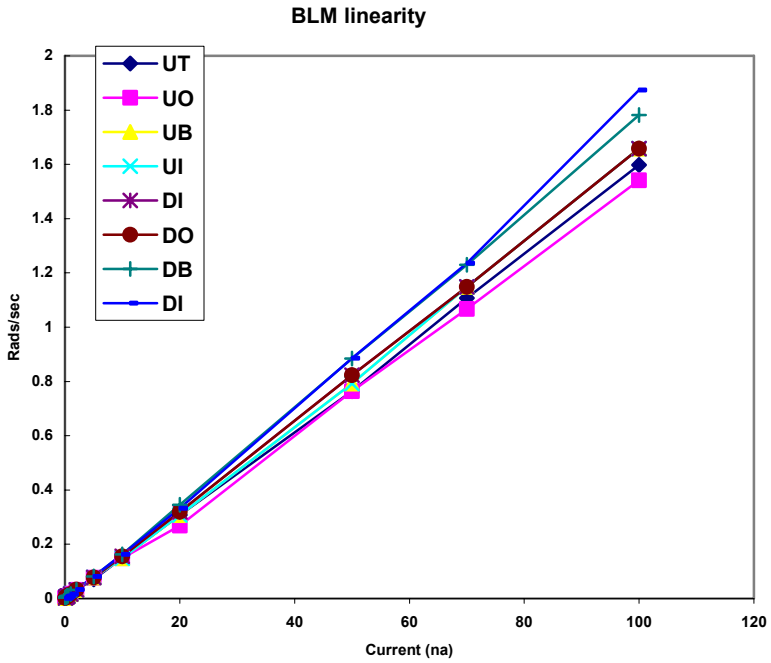

Figure 1. BLM rate output linearity.

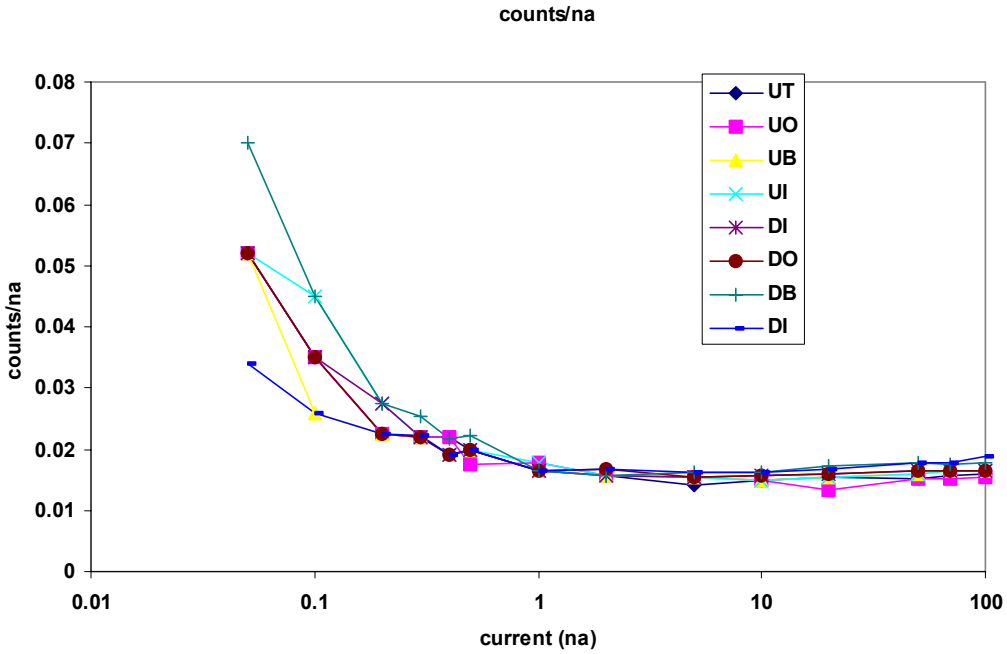

Figure 2. Normalized response

We also compared the response of the rate output to the BLM integral. The integral incorporates a hardware threshold of 0.5 V + 2 counts (we need to understand the 2

counts in terms of voltage or current). For high currents the correlation is good (figure 3). However as the current is reduced the integral readout exceeds the sum of the corresponding rate input by a substantial amount. This presumably is due to a threshold effect. This may be changed in the C336 setup. This nonlinearity may cause small loss differences at low doses to be magnified in the BLM integrals and may be the cause of the large difference in response among neighboring BLMs.

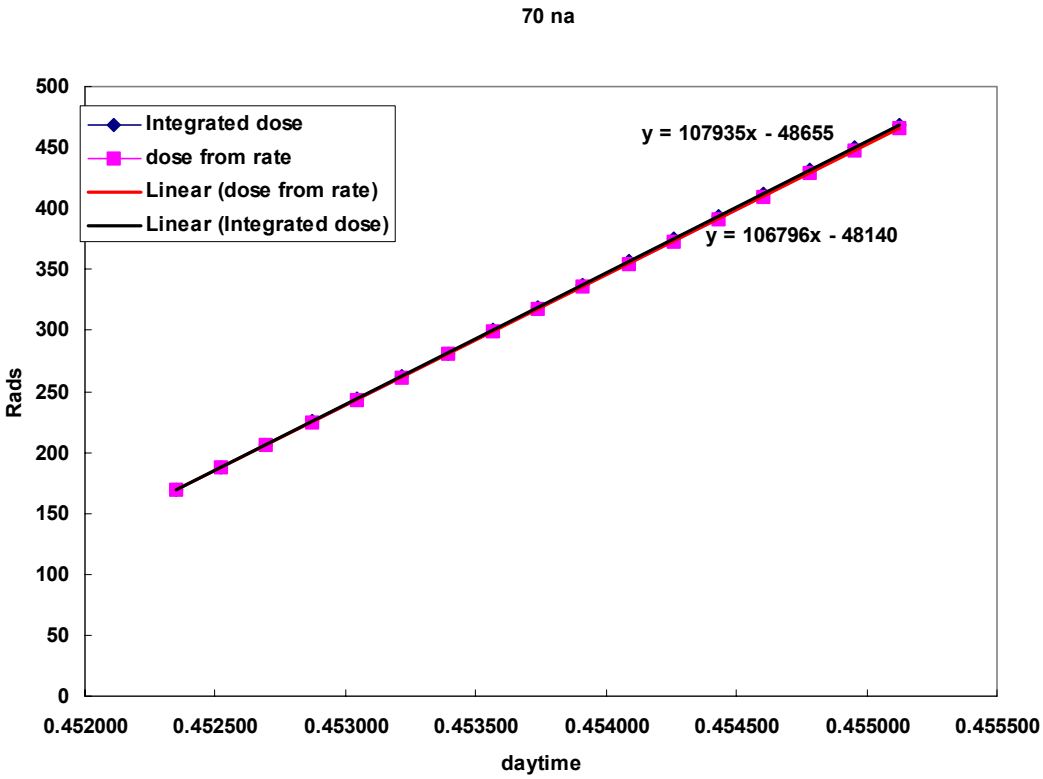

Figure 3 . Integral and rate response at 70 na.

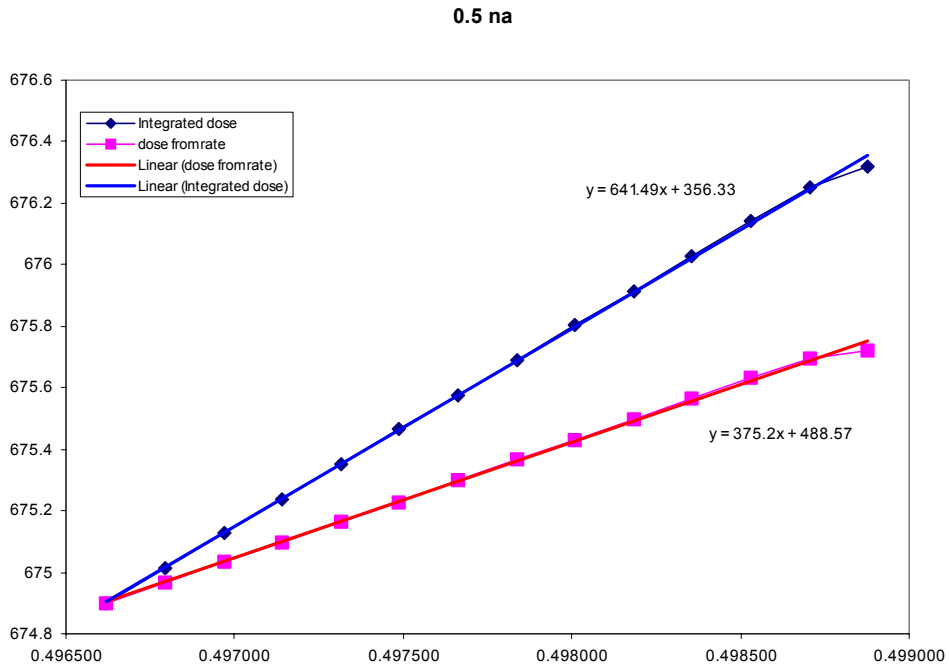

Figure 4. Integral and rate response at 0.5 na.

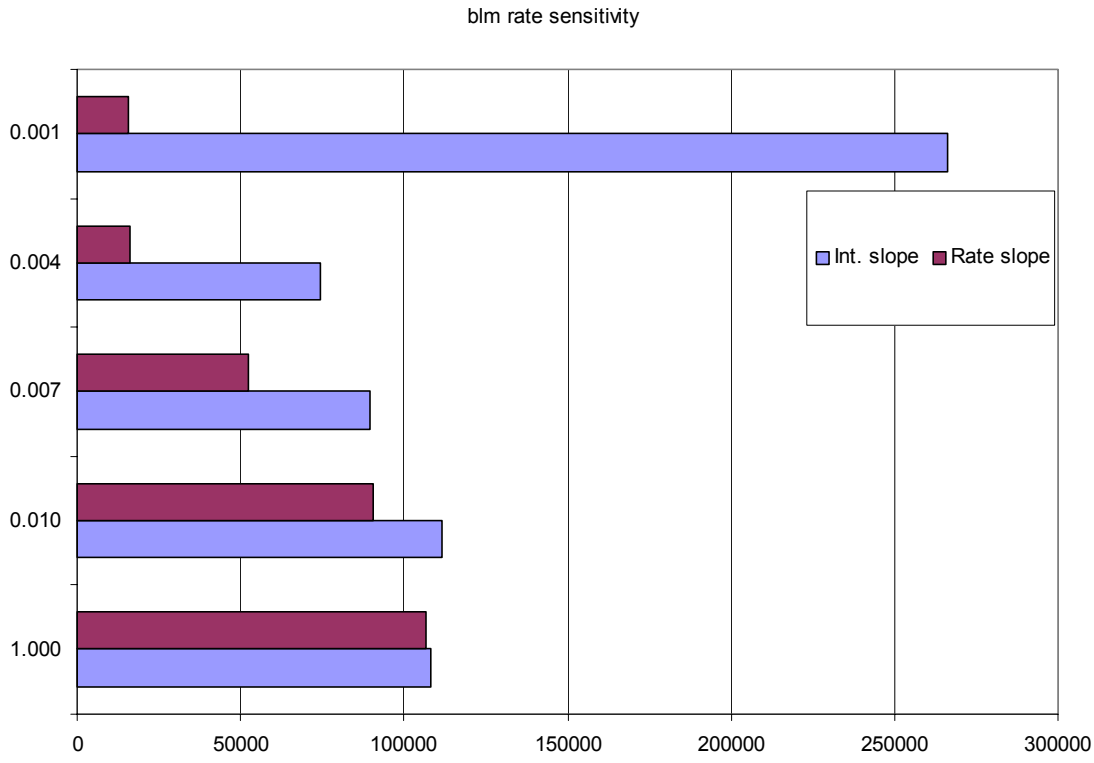

Figure 5. BLM integral and rate response as a function of current